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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/537,611

06/03/2005

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EXAMINER

KIM, JAY C

ART UNIT

PAPER NUMBER

2815

NOTIFICATION DATE

DELIVERY MODE

06/17/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/537,611	Applicant(s) KURAMOTO ET AL.	
	Examiner JAY C. KIM	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6,7,9 and 11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6,7,9 and 11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to Amendment filed June 3, 2010.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, 6, 7, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 2003/0067953) in view of Motoki et al. (US 2003/0145783).

Regarding claim 1, Kim et al. disclose a nitride semiconductor substrate (portion of Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112) formed above the mask (114), wherein the mask (114) has a polycrystalline material (116) (AlGaN, lines 5-7 of [0034]) deposited on a surface thereof, a part of the mask (114) is not covered with the group III nitride semiconductor multilayer film (composite layer of 102-112).

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface

Art Unit: 2815

thereof of $1 \times 10^7/\text{cm}^2$ or less, and voids are formed on the surface of the mask having the polycrystalline material.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than $1 \times 10^7/\text{cm}^2$ (lines 7-8 of [0316]), and further disclose that voids (voluminous defects in voluminous defect accumulating region H in Fig. 5(a)(3)) are formed on a surface of a mask (23) having a polycrystalline material ([0183], lines 7-9 of [0299], lines 1-3 of [0420], and lines 11-13 of [0427]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al. and may comprise voids formed on the surface of the mask having the polycrystalline material as disclosed by Motoki et al., because the combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate, and voids would be formed on a mask while growing a single crystal nitride semiconductor layer due to imperfect growth of a single crystal nitride semiconductor layer on an amorphous or polycrystalline material. Further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges,

Art Unit: 2815

are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 2 and 4, Kim et al. further disclose that the polycrystalline material (AlGa_N) is formed from a material containing aluminum and nitrogen as essential elements (claim 2), and the mask (114) is provided on the surface of the group III nitride semiconductor substrate (100) (claim 4).

Regarding claim 6, Kim et al. disclose a nitride semiconductor device (Fig. 3) comprising a group III nitride semiconductor substrate (100) (line 7 of [0033]), a mask (114) (line 3 of [0033]) formed over the group III nitride semiconductor substrate (100), and a group III nitride semiconductor multilayer film (composite layer of 102-112) formed above the mask (114), the group III nitride semiconductor multilayer film including an active layer (108) (line 25 of [0033]), wherein the mask (114) has a polycrystalline material (116) (AlGa_N, lines 5-7 of [0034]) deposited on a surface thereof, a part of the mask (114) is not covered with the group III nitride semiconductor multilayer film (composite layer of 102-112).

Kim et al. differ from the claimed invention by not showing that the group III nitride semiconductor substrate has a dislocation density in a vicinity of a surface thereof of $1 \times 10^7/\text{cm}^2$ or less, and voids are formed on the surface of the mask having the polycrystalline material.

Motoki et al. disclose a group III nitride semiconductor substrate (Fig. 10(5)) having a dislocation density in a vicinity of a surface thereof of less than $1 \times 10^7/\text{cm}^2$ (lines 7-8 of [0316]), and further disclose that voids (voluminous defects in voluminous defect accumulating region H in Fig. 5(a)(3)) are formed on a surface of a mask (23) having a polycrystalline material ([0183], lines 7-9 of [0299], lines 1-3 of [0420], and lines 11-13 of [0427]).

Since both Kim et al. and Motoki et al. teach a group III nitride semiconductor substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the group III nitride semiconductor substrate disclosed by Kim et al. may have a low dislocation density as disclosed by Motoki et al. and may comprise voids formed on the surface of the mask having the polycrystalline material as disclosed by Motoki et al., because the combined nitride semiconductor substrate could be used for improving device characteristics due to low dislocation density of the substrate, and voids would be formed on a mask while growing a single crystal nitride semiconductor layer due to imperfect growth of a single crystal nitride semiconductor layer on an amorphous or polycrystalline material. Further, the claim is *prima facie* obvious without showing that the claimed range of a dislocation density achieves unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*,

Art Unit: 2815

205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 7, 9 and 11, Kim et al. further disclose that the polycrystalline material (AlGaN) is formed from a material containing aluminum and nitrogen as essential elements (claim 7), the mask (114) is provided on the surface of the group III nitride semiconductor substrate (100) (claim 9), and the mask (114) is provided in a vicinity of a device separating groove (either groove on both sides) of the nitride semiconductor device (Fig. 3) (claim 11).

Response to Arguments

3. Applicants' arguments filed June 3, 2010 have been fully considered but they are not persuasive.

Applicants argue that "the term "void" in the present invention means a space on the surface of the mask", that "however, Kim et al and Motoki et al do not teach or suggest forming voids on the mask to suppress dislocations", and that "therefore, it is not possible to form voids that are effective in suppressing dislocations on the mask in Kim et al." (1) Applicants do not specifically claim a shape, a function and physical dimensions of recited "voids". (2) It is improper to import claim limitations from the specification. See MPEP 2111.01.

Applicants argue that "however, Motoki et al's [sic] vacancies are formed by gathering dislocations on the surface of the mask, and are not "voids", and that ""Voids" on the surface of the mask are not disclosed in Motoki et al. (1) Merriam-Webster

Art Unit: 2815

dictionary defines “void” as “empty space”, and “vacancy” as “empty space : void”.

Therefore, as acknowledged by Applicants, Motoki et al. teach “vacancies”, which is synonymous with “voids”, and therefore Applicants cannot argue that Motoki et al.’s

vacancies are not voids. (2) As stated above, Applicants do not specifically claim a

shape, a function and physical dimensions of recited “voids” or how the “voids” are

formed. (3) It is improper to import claim limitations from the specification. See MPEP

2111.01.

Conclusion

4. Applicants' amendment necessitated the new ground of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicants are reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 2815

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAY C. KIM whose telephone number is (571) 270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. K./

Examiner, Art Unit 2815

June 10, 2010

/Kenneth A Parker/

Supervisory Patent Examiner, Art Unit 2815